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Hog Cholera Serum

REPORT

of the

DIRECTOR

of the

STATE BIOLOGICAL LABORATORY

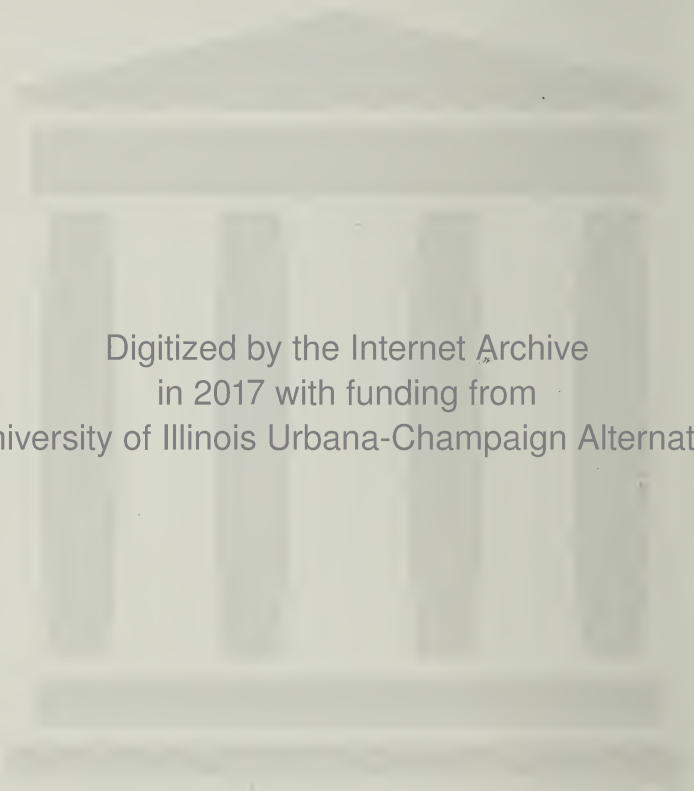
Established in Connection with the

Iowa State College of Agriculture
and Mechanic Arts

For the Period Ending December 31, 1914

Ames, Iowa

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LETTER OF TRANSMITTAL

IOWA STATE COLLEGE OF
AGRICULTURE AND MECHANIC ARTS
Ames, Iowa, February 1, 1915.

To the State Board of Education:

GENTLEMEN: Chapter 227 of the laws of 1913 authorized the State Board of Education to establish in connection with the Iowa State College of Agriculture and Mechanic Arts, a laboratory for the manufacture of hog cholera serum, toxines, vaccines and biological products, and to provide the necessary equipment therefore. The same law directs the president of this college to appoint the director of the laboratory and such assistants as are deemed necessary to efficiently carry on the work. Dr. Charles H. Stange, Dean of our division of Veterinary Medicine, was appointed Director of the laboratory, which is designated "The State Biological Laboratory."

The chief and almost only work of the laboratory has been the production of hog cholera serum. In this work we have been highly successful. The act establishing the laboratory carried an appropriation of \$35,000 to provide equipment and start the work. It provided also that serum should be sold approximately at cost. Today we have a plant, equipment and stock of serum that are worth somewhat more than the original appropriation and the state could close operations at a profit should it desire to do so. Through the operations of this laboratory it is estimated that in the past twelve months no less than \$3,000,000 worth of hogs have been saved from cholera in this state. Furthermore, the state laboratory is setting a standard for commercial serum production and in this manner its value far exceeds the benefit that has come from the distribution of serum which is made here.

Director Stange has transmitted to me a report covering the establishment of the laboratory and its operations, and I hand you herewith this report with recommendation that it be published.

Very respectfully,

R. A. PEARSON,
President.

Report of State Biological Laboratory

Division of Veterinary Medicine

Ames, Iowa, January 25, 1915.

*President R. A. Pearson, Iowa State College of Agriculture and
Mechanic Arts.*

DEAR SIR: I beg to submit for your consideration the following report of the State Biological Laboratory from its establishment until January 1, 1915:

HISTORICAL.—The first outbreak of hog cholera recorded in the United States occurred in Ohio in 1833. It was reported from South Carolina in 1837, Georgia in 1838, and Alabama, Florida, Illinois and Indiana in 1840. During the five years from 1855-60, seven outbreaks were reported in Iowa, so that Iowa has had about sixty years' experience with the disease. The report of the secretary of the Iowa State College and Farm dated February 6, 1862, includes the following:

“HOG CHOLERA.—Although this disease had not appeared much amongst the hogs of Iowa, in Illinois it has destroyed them by the thousands.” The same report contains the following from the Davenport Democrat, which indicates some of the early erroneous ideas concerning the nature of hog cholera:

This disease, which has been known to prove so fatal to swine, has, we are informed, lately made its appearance in this vicinity. The first instance was among the swine of Edwin Smith, of this township. He first observed that one of his small hogs was being singularly affected when attempting to eat the corn which was thrown before it. It would first take an ear of corn in its mouth, then whirl about rapidly and squeal as if in great pain, and then go into a fit. This was the case every time the hog was fed. Mr. Smith was puzzled to know what could be the matter with the animal. At first he thought the trouble was occasioned by the breaking of a tooth, and consequent exposure of the nerve, but as the fits became worse and worse, he gave up that idea and waited for further developments. One morning a few days after, the hog was found dead in the pen. He was thrown out, and Mr. S. discovered upon examination of the mouth that there were on either side of the jaw between the tusks and the front teeth, teeth perfectly black. This discovery presented a key to the whole difficulty. He then proceeded to examine some of the balance of the herd, and almost invariably found the disease operating in different stages. Out of about 90 hogs, in his pens, upwards of 80 had the black tooth, or, as some term it (although we can't see the reason why) the hog cholera.

Here was a fair chance to stand a heavy loss. Many of his hogs were very valuable—and all fine stock. He recollected of having in his “scrap book” an article which, several years ago, he had taken from a newspaper, and laid away for future reference, which related to a disease of this kind. On hunting it up, he found the case was

one in point, and proceeded to apply the remedy. The following is the article:

"The Hog Cholera—A New Discovery—Mr. J. P. Dunn, of Knight township, in this county, called in our office yesterday and gave us some interesting details in reference to experiments which have been made in his neighborhood on the hog disease, some particulars of which we give for the benefit of our readers.

"Mr. Dunn says that it has been discovered that in all hogs afflicted with this disease, there is a 'false tooth' found, similar to the 'blind tooth' in horses. This tooth is perfectly black in appearance, and seems to be a sort of an erratic, or superfluous offshoot, growing out from the outside of the upper jaw, one on each side, and situated between the tusk and the grinders. Mr. D. informed us that two of his neighbors, Mr. O. P. Aiken and Daniel James, had examined a large number of hogs, and had found that every diseased hog had this black tooth.

"They also extracted these teeth from a number of hogs, by knocking them out, and the hogs so treated soon recovered, some are entirely well and others are now just getting over it. Hogs affected with this disease refuse to eat, but Mr. D. says that as soon as these teeth are extracted they begin to eat corn readily. He was not prepared to say whether the disease was caused by an inability to eat on account of these extra teeth, or whether the teeth were only the result of the disease, and a removal of which would remove the seat of the disease itself. Be this as it may, sufficient experiments were tried to convince those who saw the trial, that two facts were established: First, that all cholera diseased hogs have these black teeth growing, one out of each upper jaw, as we have described; second, that the removal of these teeth relieves the hog, and is a great remedy if not a certain cure.—Evansville (Ind.) Enquirer."

Mr. Smith took a cold chisel, hammer and plenty of help, and in the course of two days had knocked out all the black teeth, root and branch. It was no small job by any means. He then hunted up the following recipe in his "recipe book," and speedily applied the further remedy therein mentioned.

The following is contributed to the Journal from Wilsonville, Spence county, Kentucky, as a "certain cure for hog cholera:"

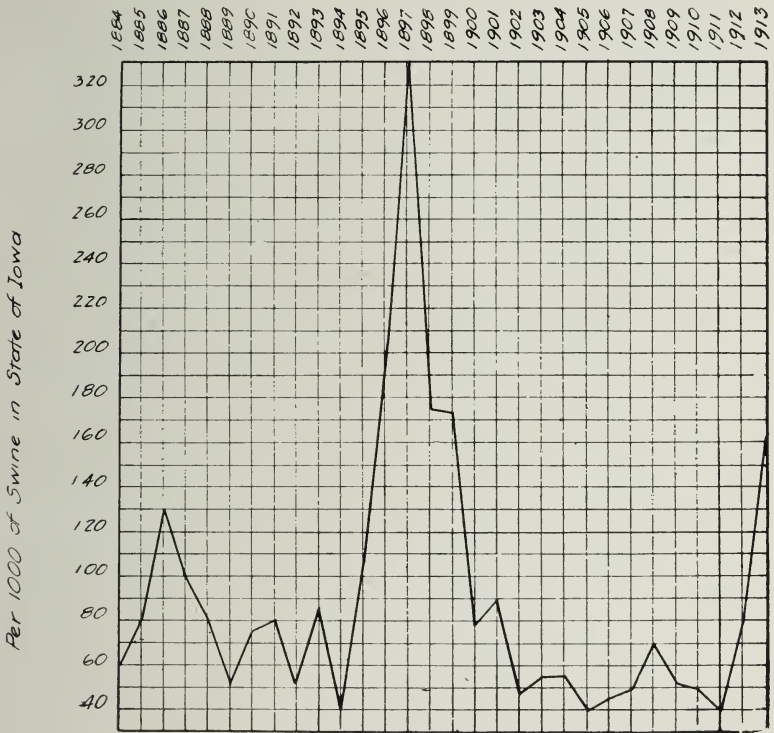
"Gentlemen: Please publish the following cure for 'Hog cholera:' Pulverize and mix well: Sulphur, 4 pounds; madder, 4 do; saltpetre, 2 do; black antimony, 2 do. If your hogs are sick, give to each, one table spoonful twice a day, night and morning, until cured. As a preventive, give to each hog one tablespoonful twice a week. This remedy has been used extensively in our neighborhood, and in nearly every case has affected a cure. As a preventive, we think it infallible.

"THOMAS D. DALE,
"M. L. HUFFMAN."

He gives his hogs this medicine in their swill and finds that they are all in a sound thriving condition.

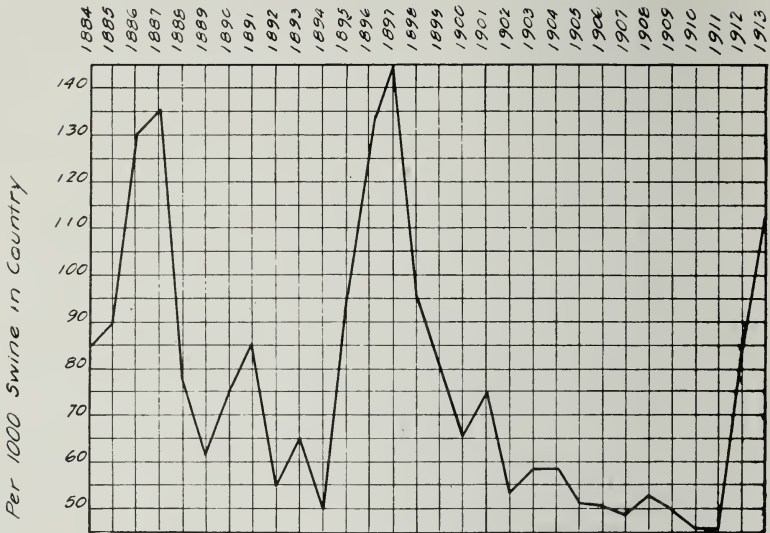
PREVALENCE AND LOSSES.—From this time until 1884 we have reports of the more or less frequent occurrence of hog cholera. No approximate figures are available, however, concerning the losses. It should be noted that the disease becomes widespread once in ten to fifteen years with an interval of four to ten years from the passage of one “wave” until the beginning of another. In other words a “wave” lasts about six years. This is shown by the following chart :

Swine Losses From Diseases in Iowa



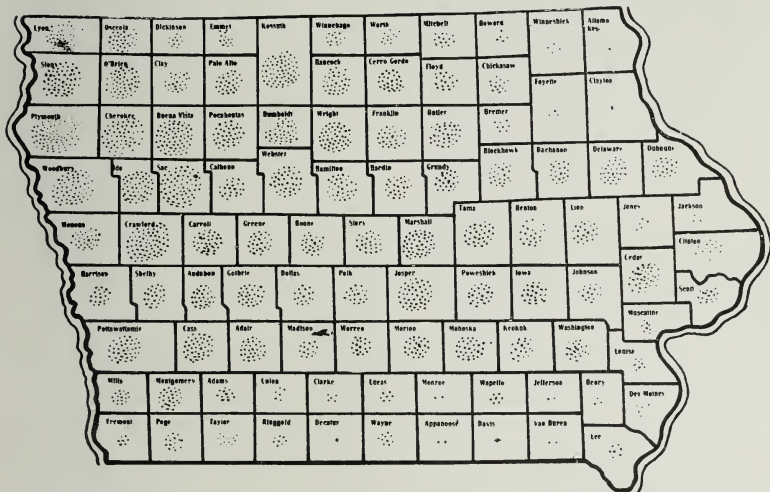
The following chart showing the losses for the United States is given as an interesting comparison with the one of Iowa.

Swine Losses From Diseases in United States



These charts have a special significance in that they show that the full force of the general outbreak of the disease was upon us when we were asked to take up work along hog cholera lines. To organize a work broad enough to contemplate the protection of approximately nine million animals, valued at over one hundred million dollars with practically nothing to start with and at a time when the scourge was so intense, was no small undertaking.

The following map records the losses of hogs due to disease in Iowa during 1913. It is safe to estimate that ninety to ninety-five per cent of these losses are due to cholera.



The following table (from the Iowa Year Book of Agriculture) gives the number of hogs in each county on July 1, 1913, and the losses during the year 1913:

Counties	Hogs on farm July 1, 1913	Hogs lost from hog cholera 1913	Counties	Hogs on farm July 1, 1913	Hogs lost from hog cholera 1913
Adair	123,500	32,151	Jefferson	53,867	3,207
Adams	81,896	12,080	Johnson	122,361	17,646
Allamakee	67,294	993	Jones	114,700	9,470
Appanoose	35,542	1,933	Keokuk	143,592	20,620
Audubon	94,774	29,716	Kossuth	136,664	78,295
Benton	124,075	25,770	Lee	47,580	6,978
Blackhawk	92,020	26,480	Linn	125,416	24,196
Boone	87,811	26,810	Louisa	59,451	12,665
Bremer	67,357	8,250	Lucas	41,243	1,001
Buchanan	94,894	22,117	Lyon	111,771	70,181
Buena Vista	118,910	68,286	Madison	102,448	16,584
Butler	95,642	37,211	Mahaska	127,338	30,899
Calhoun	59,803	23,755	Marion	91,540	27,030
Carroll	99,415	39,318	Marshall	111,888	48,293
Cass	129,832	42,266	Mills	59,458	16,632
Cedar	154,118	42,729	Mitchell	66,807	13,810
Cerro Gordo	82,952	43,255	Monona	99,292	37,085
Cherokee	152,410	63,223	Monroe	35,392	1,644
Chickasaw	69,651	16,595	Montgomery	87,817	28,403
Clark	57,689	4,918	Muscatine	78,305	11,702
Clay	87,953	31,875	O'Brien	111,650	58,865
Clayton	148,255	1,700	Osceola	60,983	36,620
Clinton	289,325	19,999	Page	103,296	30,809
Crawford	163,748	71,865	Palo Alto	76,698	46,260
Dallas	96,253	18,436	Plymouth	171,911	105,055
Davis	41,441	280	Pocahontas	74,278	38,651
Decatur	58,368	1,237	Polk	53,567	20,937
Delaware	120,379	33,348	Pottawattamie	188,776	42,065
Des Moines	61,188	9,353	Poweshiek	130,514	24,902
Dickinson	38,414	17,716	Ringgold	67,375	8,625
Dubuque	99,855	23,299	Sac	121,722	67,715
Emmet	44,296	18,505	Scott	85,609	21,860
Fayette	114,154	6,158	Shelby	140,615	25,118
Floyd	76,112	18,046	Sioux	170,141	123,101
Franklin	117,669	31,367	Story	82,843	27,672
Fremont	58,947	7,271	Tama	135,666	31,407
Greene	66,584	26,568	Taylor	84,554	18,062
Grundy	88,193	23,618	Union	63,556	7,377
Guthrie	96,816	30,932	Van Buren	48,216	2,844
Hamilton	94,920	35,526	Wapello	58,869	7,606
Hancock	78,117	38,672	Warren	89,302	18,270
Hardin	76,887	28,015	Washington	121,485	24,433
Harrison	97,172	20,122	Wayne	64,241	10,487
Henry	57,796	2,861	Webster	79,441	40,381
Howard	61,092	7,223	Winnebago	56,559	14,639
Humboldt	80,836	46,225	Winneshiek	110,287	3,543
Ida	101,686	52,358	Woodbury	122,980	61,998
Iowa	118,876	3,656	Worth	56,958	16,427
Jackson	93,911	3,502	Wright	87,061	49,718
Jasper	141,360	48,499	Total	9,397,273	2,709,876

DEVELOPMENT OF SERUM.—While Dr. E. A. deSchweinitz was attempting in the Bureau of Animal Industry at Washington to produce an antitoxin for hog cholera by using cultures of *B. sui pestifer*, he became doubtful concerning the generally accepted view that this organism was the true cause of the disease. He started some experiments which, however, were not completed on account of his sickness and death. The work was then taken up by Dr. M. Dorset, and in 1903 the Bureau of Animal Industry announced that “the primary cause is neither the hog cholera bacillus nor the swine plague bacillus.” That the disease is due to a filterable virus, had been discovered.

In 1906 the Bureau announced successful experiments in which hog cholera serum was used. This serum was prepared in about the same manner as at present. During May, 1908, a conference of veterinarians was called at Ames in order to stimulate the different states to take up the production of hog cholera serum. Interesting extracts of the proceedings of this conference follow:

PROCEEDINGS OF THE CONFERENCE OF FEDERAL AND STATE
OFFICERS HELD IN AMES, IOWA, MAY 30, 1908

The purpose of this conference was to discuss the practical application of a vaccine recently developed by Doctors Dorset and Niles of the Bureau of Animal Industry, and determine lines of investigation work in connection with the use of the vaccine in the control of hog cholera. The conference was held in Agricultural Hall, on the campus of the Iowa State College. Dr. A. D. Melvin acted as chairman of the conference.

The following persons were present: Dr. A. D. Melvin, chief of the Bureau of Animal Industry; Dr. M. Dorset, chief of the Biochemical Division of the Bureau, and Mr. H. J. Shore of the same bureau, all of Washington, D. C.; Dr. W. B. Niles, in charge of the bureau's field experiments in Iowa; Dr. R. R. Dinwiddie, pathologist and bacteriologist of the Arkansas Experiment station, Fayetteville; Dr. F. S. Schoenleber, experiment station veterinarian, Manhattan, Kansas; Dr. A. T. Peters, animal pathologist of the Nebraska Experiment station, Lincoln; Director C. F. Curtiss and Drs. John H. McNeil and C. H. Stange, of the Iowa Experiment station, Ames; Dr. J. W. Conaway, experiment station veterinarian, Columbus, Mo.; Dr. M. H. Reynolds, experiment station veterinarian, St. Anthony Park, St. Paul, Minn.; Dr. Paul Fischer, state veterinarian, Columbus, Ohio; Dr. C. E. Marshall, experiment station bacteriologist, Lansing, Mich.; and Dr. R. A. Craig, experiment station veterinarian, Lafayette, Ind.

Following the address by the chairman, stating the purpose of the conference, the state officials were called on to express their opinions regarding the use of the vaccine and means of production and distribution to the farmers in their respective states.

Dr. McNeil stated the interest in the prevention of hog cholera in Iowa was great. He then spoke of the vaccination work conducted by himself and Dr. Stange with vaccine furnished by the bureau of animal industry. His opinion relative to the distribution of the vaccine was, that it would be best not to allow commercial firms to handle it. He believed that the bureau of animal industry should produce and distribute it, the same as tuberculin, etc., and that it should be used in connection with quarantine work.

The question of the production of vaccine by private individuals was raised by Dr. McNeil. Dr. Dorset stated that the production of the serum was free to all individuals.

Director Curtiss was asked to discuss the vaccination work. He stated that it was highly gratifying that such results could be obtained from the use of a hog cholera vaccine, but was unable to say by what methods it could be made most available. He did not believe that experiment station funds could be used for other than experimental work. The funds providing for the practical application of the vaccine should be supplied by special legislation, and in his opinion there was sufficient evidence to justify a request for state aid with which to carry on the work. He also mentioned the publicity that the press had given the vaccine, and as a result of this work there would be placed on the market "quack vaccines," making it necessary to guard against such productions.

LEGISLATION.—At the beginning of the year 1909, or about seven months after this conference was held, the legislature convened and a bill was introduced as "House File No. 153—By Wilson," for *an act to establish a laboratory at the Iowa State College of Agriculture and Mechanic Arts to manufacture hog cholera serum and tuberculin and make an appropriation therefor*. This was later changed and the following was passed:

CHAPTER 151 ESTABLISHMENT OF LABORATORY FOR MANUFACTURE OF HOG CHOLERA SERUM

AN ACT to establish a laboratory for the manufacture of hog cholera serum at or near Des Moines under the supervision of the state veterinary surgeon and make an appropriation therefor. (Additional to chapter fourteen (14) of title twelve (XII) of the code, relating to state veterinary surgeon.)

Be it Enacted by the General Assembly of the State of Iowa:

Section 1. Establishment of authorized—assistants—serum, how sold—receipts, how expended—appropriation. The state veterinary surgeon is hereby authorized to establish a laboratory for the manufacture of hog cholera serum, and to provide the necessary equipment therefor at or near Des Moines, Iowa. The state veterinary surgeon shall be director of said laboratory. He shall employ such assistants as he may deem necessary to carry on said work. The director of the laboratory with the approval of the executive council shall fix the salaries of the employes connected with the manufacture of said serum. Upon application made to the director of the laboratory, he shall furnish said serum for use within the state of Iowa at actual cost of manufacture, and shall also furnish applicants with instructions for the use of same. If said applicant should require the services of the state veterinary surgeon or his assistants, the expenses for their services rendered shall be paid by the applicant to the director of the laboratory or his authorized assistant. The receipts from the sale of serum and from salvage shall be used by the director of the laboratory to promote the work, and he shall file with the executive council a separate official and itemized statement of all such receipts and expenditures in lieu of turning such receipts into the state treasury, as provided in section one hundred seventy-d (170-d) of the supplement of the code, 1907. The director of the laboratory shall issue receipts for all moneys received by him and shall annually file with the executive council a complete statement of all moneys received

by him or expended in the equipping and conducting of said business. Upon passage and publication of this act, there shall be made immediately available an appropriation out of any moneys in the state treasury not otherwise appropriated, the sum of eight thousand dollars (\$8,000) or so much thereof as may be necessary to carry out the provisions of this act. The amount above mentioned shall be paid upon the order of the director of the laboratory upon approval by the executive council.

Approved April 12, A. D. 1909.

Two years later (1911) the following legislation was enacted in regard to hog cholera:

CHAPTER 114
MANUFACTURE AND SALE OF HOG CHOLERA SERUM
H. F. 372

AN ACT to amend section one (1) of chapter one hundred fifty-one (151) of the acts of thirty-third general assembly, relating to the manufacture and distribution of hog cholera serum and providing an appropriation of \$5,000.00 for the maintenance of the laboratory for the manufacture of such serum.

Be it Enacted by the General Assembly of the State of Iowa:

Section 1. **Serum how sold.** That the law as it appears in section one of chapter 151 of the acts of the thirty-third general assembly be, and the same is hereby amended as follows:

By striking out all the words following the word "at" in the 9th line of said section down to the comma in the 10th line of said section, and inserting in lieu thereof the words "twenty cents per fluid ounce."

Sec. 2. **Appropriation.** There is hereby appropriated out of any moneys in the state treasury not otherwise appropriated the sum of five thousand (\$5,000.00) dollars or so much thereof as may be necessary to carry out the provisions of this chapter.

Approved April 13, A. D. 1911.

In 1913 the 35th General Assembly provided that assistance in suppressing hog cholera should be given the state by this institution and these provisions are outlined in Chapter 227 of the Acts of Thirty-fifth General Assembly:

AN ACT to establish a laboratory for the manufacture and distribution of hog cholera serum, toxins, vaccines and biological products at the Iowa State College of Agriculture and Mechanic Arts, under the supervision of the president of said college, and to make an appropriation therefor; to abandon the laboratory for manufacturing of hog cholera serum now being operated by the state of Iowa; to regulate the sale and keeping for sale, or use or using of hog cholera serum and virus; to provide penalties for the violation of said regulations; and to repeal chapter one hundred fifty-one (151) of the acts of the thirty-third general assembly and chapter one hundred fourteen (114) of the acts of the thirty-fourth general assembly.

Be it Enacted by the General Assembly of the State of Iowa:

Section 1. The state board of education is hereby authorized and directed to establish at Ames, Iowa, in connection with Iowa state

college of agriculture and mechanic arts, a laboratory for the manufacture of hog cholera serum, toxins, vaccines and biological products and to provide the necessary equipment therefor. The president of said college shall appoint the director of said laboratory and such assistants as are deemed necessary to efficiently carry on said work and shall, with the approval of said board, fix the salaries of said assistants.

Sec. 2. The director of said laboratory shall on application, furnish said serum to any person within the state of Iowa for use in his herd only, together with specific instructions for the use of same, at the approximate cost of manufacture, and such cost shall be stated on the package. Any surplus serum or other biological products may be sold by said director at a reasonable profit to any applicant outside of the state. The director of the serum laboratory is authorized to purchase serum or other biological products which he deems reliable and he may sell the same at approximate cost in the same manner as products of the laboratory are sold, at any time it appears to him that the available supply will not be sufficient to meet the demand.

Sec. 3. The director shall issue receipts for all moneys received by him for serum and other biological products sold and shall deposit all such funds with the treasurer of the college, which treasurer shall be responsible on his bond for the same. Upon receipt of said moneys the said treasurer shall issue duplicate receipts therefor, one of which he shall deliver to the director and the other to the secretary of the state board of education. Said moneys shall be kept by said treasurer in a separate fund to be known as the serum fund, and he shall pay out from said fund as other college funds are expended, but only for expenses directly connected with the maintaining of said laboratory and the manufacture, purchase and distribution of said serum and biological products.

Sec. 4. The director of said laboratory shall have the power and it is made his duty to establish and declare the standard degree of potency of hog cholera serum for successfully treating, curbing and controlling hog cholera or swine plague. Any person, firm, company or corporation before selling or offering for sale within this state any hog cholera serum, shall first make application to the director of the laboratory herein created, for permission to sell the same in the state. Said application shall give the name of said person, firm, company or corporation with its place or places of business. Such other information and samples of serum shall be furnished whenever required by the director. If the director is satisfied that said person, firm, company or corporation is fit, proper and reliable, upon the furnishing of a bond in the sum of one thousand dollars (\$1,000.00) by said applicant, which bond shall be approved by the director, he shall issue to said person, firm, company or corporation a permit to sell said serum within the state for a period of one calendar year or part

thereof, for which permit he shall collect the sum of twenty-five dollars (\$25.00), which money shall be deposited and handled the same as moneys received for the sale of serum. At the time of issuing said permit, the said director shall deliver to said applicant a statement showing the standard or degree of potency of hog cholera serum as established by said director and said permit may at any time be revoked and cancelled by said director when it becomes evident to him that the terms on which it was issued are being violated. No hog cholera serum shall be sold or offered for sale or use, or be used in this state which is below the standard test of potency established by the director, except for experimental purposes at the place of manufacture of hog cholera serum and under the direction of manager thereof.

Sec. 5. The bond required in section four (4) of this act, shall be to the effect that the person, firm, company or corporation holding a permit shall forfeit and pay to the director the sum of five hundred dollars (\$500.00) whenever upon inspection it shall be ascertained that any serum kept for sale or distribution or offered for sale by any person, firm, company or corporation is below the standard provided for by the director, which money shall when collected be deposited and handled the same as moneys received from the sale of serum. The attorney general is hereby authorized and it is made his duty to proceed upon the bond to collect the amount forfeited.

Sec. 6. The director of said laboratory is authorized to procure virulent blood or virus from cholera infected hogs and to distribute the same at approximate cost for use with hog cholera serum and under restrictions concerning payments as established in section three (3) of this act. No person, firm, company or corporation shall distribute or sell any portion of virulent blood or virus from cholera infected hogs unless permitted in writing so to do by the director of said laboratory and under such regulations as the said director may issue, and such permit shall specify the time and place, and when and where the said virus may be used. And no person shall use any portion of virulent blood or virus from cholera infected hogs unless he has received special instruction in reference to such use of such virulent blood or virus which is satisfactory to the director of said laboratory and said director has issued a permit to such person, and such permit shall be cancelled by said director for cause which said director may deem sufficient; provided, that these restrictions shall not apply to official work of, first, veterinary members of the animal health commission or, second, representatives of the United States bureau of animal industry; but all virulent blood or virus used by such persons shall be reported to the director of the serum laboratory in such manner as he may require. Any person, firm, company or corporation violating the terms herein stated shall be punished the same as provided for in section eight (8) of this act.

Sec. 7. The director of said laboratory or the state veterinarian or

their duly qualified deputies or assistants are hereby authorized to seize and forward to the state laboratory for examination, samples of any serum or virus used or kept for use or for sale within this state, at any time or at any place, under the police and health regulations in force in this state. The director of the state laboratory shall have power to condemn or destroy any serum or virus which he deems to be unsafe.

Sec. 8. After the taking effect of this act, any person, firm, company or corporation offering or keeping for sale in this state any hog cholera serum or virus without securing a permit from the director, or selling or offering or keeping for sale after said permit has been cancelled or has expired, any hog cholera serum, or while holding a permit, selling or offering or keeping for sale any hog cholera serum which is below the standard of potency as established and declared by said director, shall be fined in a sum not less than one hundred dollars (\$100.00) or more than five hundred dollars (\$500.00). In default of the payment of such fine, the individual, or if it be a company, firm or corporation offending, the managing agent or executive officer of such firm, company or corporation within the state, shall be imprisoned in the county jail not less than thirty (30) days or more than one hundred fifty (150) days.

Sec. 9. After the taking effect of this act, any person, firm, company or corporation wilfully using or keeping for use in this state any hog cholera serum other than that manufactured at the state laboratory or that sold by a holder of a valid permit issued by the director of the laboratory shall be punished as provided for in section eight (8) of this act.

Sec. 10. The laboratory for the manufacture of hog cholera serum now being operated by the state of Iowa, shall be discontinued and the state veterinarian is hereby directed to turn over to the director of the laboratory hereby provided for, the equipment of said discontinued laboratory. The state veterinarian is hereby authorized and directed to adjust all claims and losses and to dispose of the same in such manner and on such terms as shall be approved by the governor of the state of Iowa.

Sec. 11. There is hereby appropriated out of any money in the state treasury not otherwise appropriated the sum of thirty-five thousand dollars (\$35,000.00) or as much thereof as may be necessary to carry out the provisions of this act. The above amount or so much thereof as may be necessary to carry out the provisions of said act shall be paid by warrants drawn by the auditor of state upon the state treasurer upon the order of the board of education.

Sec. 12. That chapter one hundred fifty-one (151) of the acts of the thirty-third general assembly and chapter one hundred fourteen (114) of the acts of the thirty-fourth general assembly be and the same are hereby repealed.

Sec. 13. This act being deemed of immediate importance, shall take effect and be in full force after its publication in the Register and Leader and the Des Moines Capital, newspapers published in Des Moines, Iowa.

Approved April 23, A. D. 1913.

A laboratory was established as is provided for and the undersigned was appointed director.

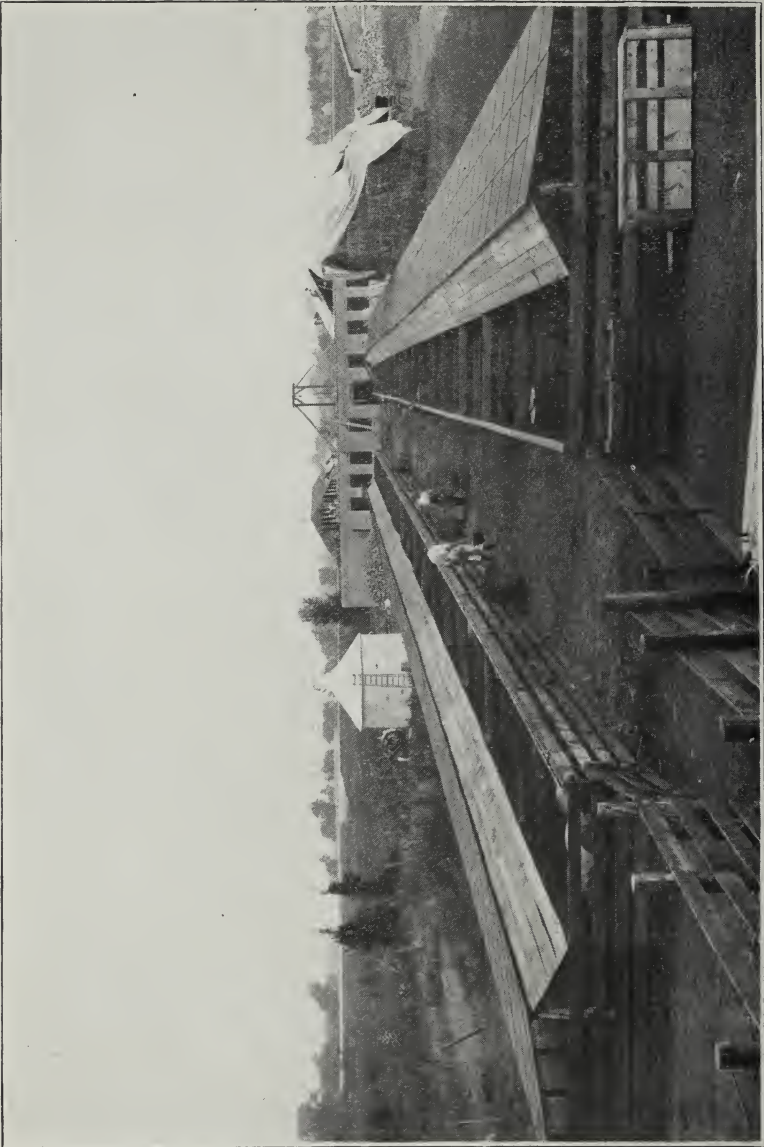
FOREIGN SERUM DISTRIBUTED.—The demand for serum at the time the laboratory was established was very heavy, in fact, a considerable number of orders were on hand before serum could be produced here, much less be tested. In order to relieve this pressure we attempted to secure serum from a plant in another state in whose product we had confidence. It became necessary to find another source of supply and we procured some serum from what was and is still considered a reliable firm in this state. This source of supply was soon exhausted and we turned to another state plant. From these three sources the following amounts of serum were distributed:

Kansas Serum.....	259,190 cc.
Commercial Serum, Sioux City.....	63,500 cc.
Kentucky Serum.....	579,060 cc.

Most of the above serum was used in serum alone treatment with the exception of a number of orders in the beginning. The foregoing was carried out under Section 2.

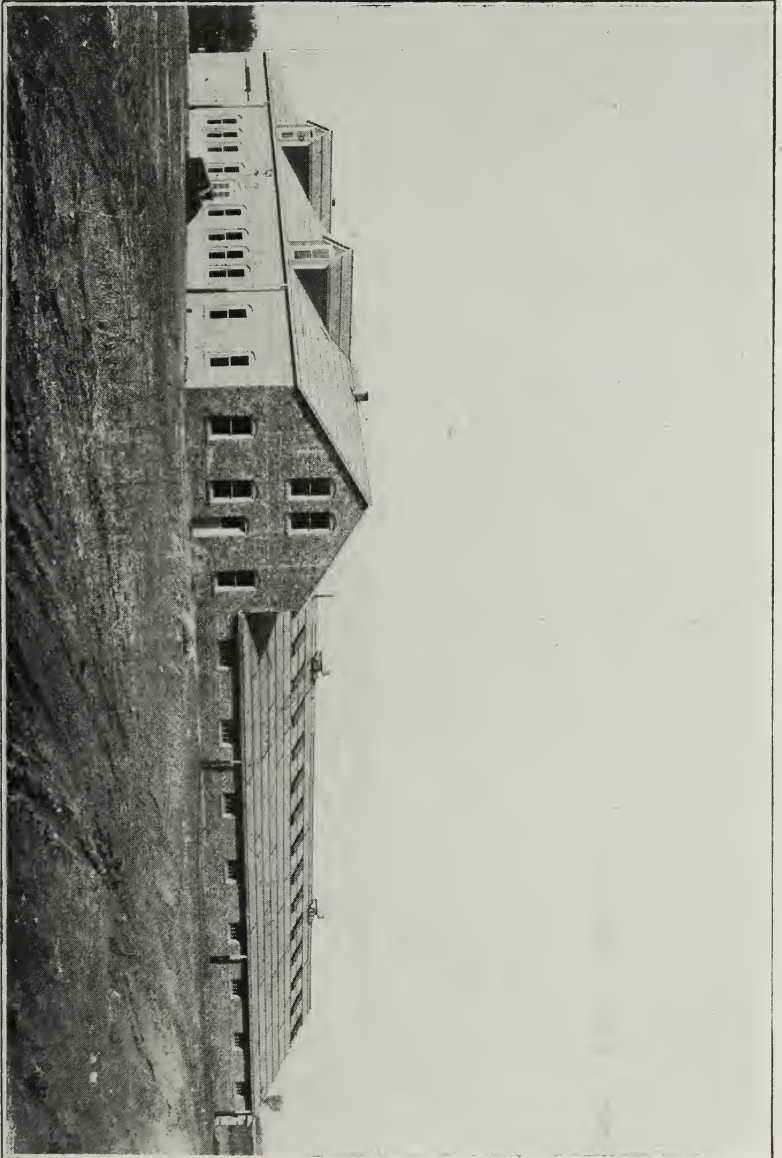
FACILITIES AND EQUIPMENT.—At the same time with the assistance of members of the veterinary faculty work was rushed to meet the other requirements of Section 2.

On account of the heavy demand it was impossible to await the construction of anything but temporary pens and thirty-two pens 16x16 were put into use.

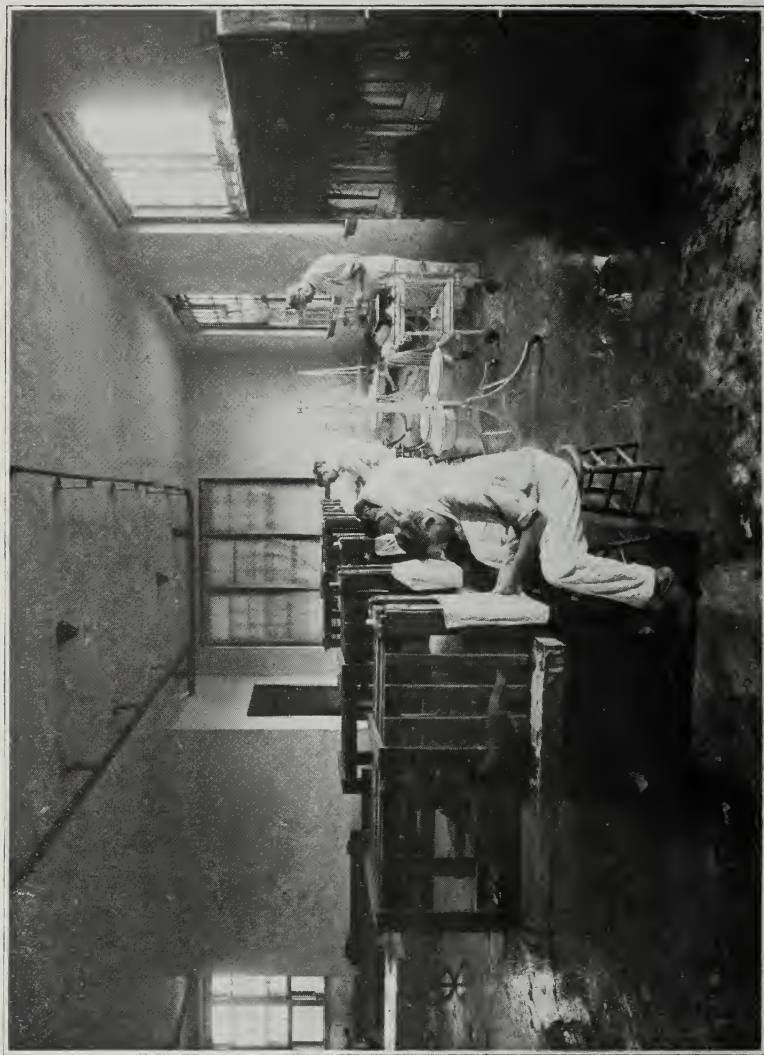


TEMPORARY PENS USED WHEN THE WORK WAS STARTED. NEW BUILDING IN CONSTRUCTION IN THE BACKGROUND

These pens were used for serum producing hogs (hyper immunes). The dissecting room in the anatomy building was cleared out and used for a bleeding room.



NEW SERUM BUILDING



THE DISSECTING ROOM OF THE ANATOMY BUILDING IN USE AS A BLEEDING ROOM

BASEMENT ROOM OF THE ADMINISTRATION BUILDING IN USE AS A LABORATORY



The basement of the administration building was fitted up as a laboratory.

The basement of the hospital building was used for virus producing shoats and a basement room in the administration building was converted into a shipping room. The latter room is still in use by the State Biological Laboratory Department. Supply pens were set aside in what is known as college park. While the above arrangement distributed the work of serum production over a considerable area which is not in the best interests of economy, it, nevertheless, met a great emergency.

PERMITS TO SELL SERUM.—It was realized before the laboratory was established that the resources at our command would not provide sufficient serum for the state and active cooperation with the commercial plants was started as is provided for in Section 4.

THE STANDARD OF POTENCY.—Under authority of the law the standard of potency was made as follows: "The dose, which shall be stated on the label, must be sufficient to prevent a susceptible hog of the weight the dose is recommended for, from showing symptoms of hog cholera when injected hypodermically with two cubic centimeters of virulent blood which will produce hog cholera in susceptible hogs of the same weight within eight days after being inoculated with the same quantity of virulent blood."

This standard embodies the requirement that the serum sold should protect against all reasonable hog cholera infection when given in the doses recommended.

The application blank required under Section 4 is as follows:

STATE BIOLOGICAL LABORATORY

Charles H. Stange, Director

Division of Veterinary Medicine, Iowa State College, Ames, Iowa
Application for Permit to Sell or Offer for Sale Hog Cholera Serum
Within the State of Iowa

The name of the person, firm, company or corporation....The place or places of business....Incorporated under the laws of the State of.... have been in business....years. The president is....resides at.... The secretary is....resides at.... (I or We)....hereby make application for permission to sell or offer for sale hog cholera serum within the State of Iowa under such restrictions and regulations as are provided for by the laws of the State of IowaPresident.Secretary.

When the law has been fully complied with the following permit is granted:

Permit to Sell or Offer for Sale Hog Cholera Serum within the State of Iowa

Name.... location.... is hereby granted permission to sell or offer for sale hog cholera serum within the State of Iowa from.... to, or until the serum sold or offered for sale is found to be lacking the required potency as established by the director of the laboratory or unless this certificate is sooner revoked for cause as provided by law. Date....Director.

The bond which has been required and which has been submitted to the Attorney General in each case for approval, is as follows:

**State Biological Laboratory for the Manufacture and Distribution of
Hog Cholera Serum, Toxins, Vaccins and Biological
Products, Ames, Iowa**

Permit Holder's Bond

Know all men by these presents: That we....(give name) of.... (location)....(if a corporation, state under the laws of what state incorporated) as principal and....as sureties, are held and firmly bound unto the State of Iowa, in the penal sum of....dollars, for the payment of which we bind ourselves, our heirs, executors and administrators firmly by these presents: The condition of the foregoing obligation is, that, whereas, the above named....has been granted a permit by the director to sell or offer for sale, hog cholera serum in the State of Iowa, for one calendar year or part thereof beginning.... A. D. 191...and that the person, firm, company or corporation holding a permit shall forfeit and pay to the director the sum of five hundred dollars (\$500.00) whenever upon inspection it shall be ascertained that any serum kept for sale or distribution or offered for sale by the above bound....(insert name of permit holder) is below the standard provided for by the director, which money shall, when collected, be deposited and handled the same as moneys received from the sale of serum. Signed this....day of....191... ..
.... State of....county of....ss. I,do solemnly swear that I will support and abide by the laws of the State of Iowa, and the provisions of this bond....(personal signature). Subscribed and sworn to by.... before me this....day of....A. D. 191.... (Seal) State of...., county of....ss. I,surety on the foregoing bond, being duly sworn, depose and say, on oath, that I am a freeholder in the State of....resident at....in the county of....and worth the sum of....(double the sum to be secured) dollars, beyond the amount of my debts, and have property liable to execution in this State equal to the sum of....(the sum to be secured) dollars. Subscribed and sworn to before me thisday of....A. D. 191.... In testimony whereof, witness my hand and official seal.... Note—At least two sureties are required who must be resident free holders of the state.

During the year 1913 permits to sell serum in the state were granted to the following persons or firms:

Name and Address	Permit No.
Dr. Herman Greeder, Cedar Rapids, Iowa.....	1
Ames Vaccine Co., Ft. Dodge, Iowa.....	2
Stock Yards Serum Co., Kansas City, Mo. (operated by M. R. Souder, Northern Branch, Newton, Iowa).....	3
Omaha Serum Co., Omaha, Nebr.	4
Stock Yards Serum Co., Kansas City, Mo.....	5
Missouri Valley Serum Co., Kansas City, Mo.....	6
American Serum Co., Kansas City, Mo.....	7
Western Serum Co., Plattsmouth, Nebr.	8
Interstate Vaccine Co., Kansas City, Mo.....	9
Hueben Serum Co., Kansas City, Mo.....	10
Northwestern Hog Cholera Serum Co., St. Paul, Minn.....	11
Sihler Hog Cholera Serum Co., Kansas City, Mo.....	12
Imperial Serum Co., Kansas City, Mo.....	13
Wilson & Parker, Columbia, Mo.....	14
Continental Serum Co., East St. Louis, Ill.....	15
Danbury Drug Co., Danbury, Iowa.....	16

St. Louis Serum Co., East St. Louis, Ill.....	17
Big O Serum Co., Kansas City, Mo.....	18
Kansas City Serum Co., Kansas City, Mo.....	19
National Serum Co., Kansas City, Mo.....	20
Eagle Serum Co., Kansas City, Kan.....	21
Kaw Valley Serum Co., Kansas City, Mo.....	22
Nelson Serum Co., Nat'l Stock Yards, Ill.....	23
Standard Serum Co., Sioux City, Iowa.....	24
Nebraska City Serum Co., Nebraska City, Nebr.....	25

The following permits were cancelled:

Name and Address	Permit No.
Interstate Vaccine Co., Kansas City, Mo.....	9
Omaha Serum Co., Omaha, Nebr.....	4

During the year 1914 the following permits were granted to sell serum in the state:

Name and Address	Permit No.	U. S. Gov. License No.
Royal Serum Co., Kansas City, Mo.....	1	12
Superior Serum Co., Kansas City, Mo.....	2	81
Chas. L. Rea, Kansas City, Mo.....	3	
Oscar Ruff Co., Sioux City, Iowa.....	4	
Grain Belt Supply Co., South Omaha, Nebr.....	5	84
Missouri Valley Serum Co., Kansas City, Mo.....	6	25
H. K. Mulford Co., Philadelphia, Pa.....	7	3
Sihler Hog Cholera Serum Co., Kansas City, Mo.....	8	24
Nebraska City Serum Co., Nebraska City, Nebr.....	9	63
Stock Yards Serum Co., Kansas City, Kan.....	10	18
Sioux City Serum Co., Sioux City, Iowa.....	11	37
St. Joe Live Stock Serum Co., St. Joe, Mo.....	12	46
Big O Serum Co., Kansas City, Mo.....	13	71
Hueben Serum Co., Kansas City, Mo.....	14	38
M. R. Stouder, Newton, Iowa.....	15	
W. G. Cleveland Co., Omaha, Nebr.....	16	
Pitman Moore Co., Indianapolis, Ind.....	17	6
Eagle Serum Co., Kansas City, Kan.....	18	2
Southern Serum Co., West Plains, Mo.....	19	69
Iowa Serum Co., Sioux City, Iowa.....	20	79
Kansas City Serum Co., Kansas City, Mo.....	21	48
Cedar Rapids Serum Co., Cedar Rapids, Iowa.....	22	40
Axtell Serum Co., South Omaha, Nebr.....	23	82
American Veterinary Supply Co., Kansas City, Mo....	24	
Standard Serum Co., Kansas City, Mo.....	25	32
Wichita & Oklahoma Serum Co., Wichita, Kan.....	26	10
Midwest Serum Co., Omaha, Nebr.....	27	7
Mayes Serum Co., South Omaha, Nebr.....	28	20
Danbury Drug Co., Danbury, Iowa.....	29	
Sioux Valley Serum Co., Sioux City, Iowa.....	30	78
Interstate Vaccine Co., Kansas City, Mo.....	31	25
Imperial Serum Co., Kansas City, Mo.....	32	14
Chicago Serum Co., 845 Exchange Ave., Chicago, Ill...	33	87
Kaw Valley Serum Co., Kansas City, Mo.....	34	26
Continental Serum Laboratories, East St. Louis, Ill..	35	21
Ames Vaccine Co., Ft. Dodge, Iowa.....	36	29
Jacob E. Decker & Sons, Mason City, Iowa.....	37	95
Great Western Serum Co., 4532 Grosse Av., Chicago, Ill.	38	92
Union Serum Co., Sioux City, Iowa.....	39	51
Standard Serum Co., Sioux City, Iowa.....	40	16
Cre-o-lone Tonic & Serum Co., Sioux City, Iowa.....	41	94

Name and Address	Permit No.	U. S. Gov. License No.
Mason S. Peters United Serum Co., St. Joe, Mo.....	42	57
St. Joseph Vet. Lab., St. Joseph, Mo.....	43	70
Elmore Live Stock Co., Peoria, Ill.....	44	96
Miller Hog Serum Co., Kansas City, Mo.....	45	59
Peoria Serum Co., Peoria, Ill.....	46	100
O. K. Serum Co., South Omaha, Nebr.....	47	62
The Kansas Serum Co., Manhattan, Kan.....	48	30
Great Western Serum Co., Jefferson Branch, Jefferson, Iowa	49	92
Chas. L. Rea, Kansas City, Mo. (for serum of his own manufacture only)	50	86
Corn State Serum Co., South Omaha, Nebr.....	51	99
Grant City Serum Co., Grant City, Mo.....	52	76
Nodaway Valley Serum Co., Skidmore, Mo.....	53	53
Tri-State Serum Co., Kansas City, Mo.....	54	15
Omaha Serum Co., South Omaha, Nebr.....	55	13
Waterloo Serum Laboratories, Waterloo, Iowa.....	56	106
The Southwestern Serum Co., Wichita, Kans.....	57	56
Tri-State Serum Co., Sioux City, Iowa.....	58	80
E. R. Squibbs & Sons Research & Biological Laboratories, New York, N. Y.....	59	83
Sioux Falls Serum Co., Sioux Falls, S. D.....	60	11
Fowler Serum Co., Kansas City, Kan.....	61	103
Canton Serum Co., Canton, S. D.....	62	105
Des Moines Serum Co., Des Moines, Iowa (temporary permit).		
State Serum & Supply Co., Des Moines, Iowa (temporary permit).		

Permits were cancelled as follows:

Name and Address	Permit No.
Chas. L. Rea, Kansas City, Mo.....	3
Nebraska City Serum Co., Nebraska City, Nebr.....	9
Midwest Serum Co., Omaha, Nebr.....	27

Before permits for 1914 were granted and in order to make the requirements of the Bureau of Animal Industry of the U. S. Department of Agriculture and those of the state harmonize, co-operation was asked of all plants holding a permit for 1913 by requesting them to produce and test serum according to standards laid down by the Bureau of Animal Industry. The response to this request was very gratifying, as indicated by the fact that all except two new plants secured a government license under the following law:

FEDERAL LAW UNDER WHICH THE ABOVE MENTIONED REGULATIONS ARE MADE

(Extract from "An act making appropriations for the Department of Agriculture for the fiscal year ending June thirtieth, nineteen hundred and fourteen," approved March 4, 1913 (37 State, 832).)

That from and after July first, nineteen hundred and thirteen, it shall be unlawful for any person, firm or corporation to prepare, sell, barter, or exchange in the District of Columbia, or in the Territories, or in any place under the jurisdiction of the United States, or to ship or deliver for shipment from one State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, any worthless, contaminated, dangerous, or harmful virus, serum,

toxin, or analogous product intended for use in the treatment of domestic animals, and no person, firm or corporation shall prepare, sell, barter, exchange, or ship as aforesaid any virus, serum, toxin, or analogous product manufactured within the United States and intended for use in the treatment of domestic animals, unless and until the said virus, serum, toxin, or analogous product shall have been prepared, under and in compliance with regulations prescribed by the Secretary of Agriculture, at an establishment holding an unsuspended and unrevoked license issued by the Secretary of Agriculture as hereinafter authorized. That the importation into the United States, without a permit from the Secretary of Agriculture, of any virus, serum, toxin, or analogous product for use in the treatment of domestic animals, and the importation of any worthless, contaminated, dangerous, or harmful virus, serum, toxin, or analogous product for use in the treatment of domestic animals, are hereby prohibited. The Secretary of Agriculture is hereby authorized to cause the Bureau of Animal Industry to examine and inspect all viruses, serums, toxins and analogous products, for use in the treatment of domestic animals, which are being imported or offered for importation into the United States, to determine whether such viruses, serums, toxins, and analogous products are worthless, contaminated, dangerous, or harmful, and if it shall appear that any such virus, serum, toxin or analogous product, for use in the treatment of domestic animals, is worthless, contaminated, dangerous, or harmful, the same shall be denied entry and shall be destroyed or returned at the expense of the owner or importer. That the Secretary of Agriculture be, and hereby is, authorized to make and promulgate from time to time such rules and regulations as may be necessary to prevent the preparation, sale, barter, exchange, or shipment as aforesaid of any worthless, contaminated, dangerous or harmful virus, serum, toxin, or analogous product for use in the treatment of domestic animals, and to issue, suspend, and revoke licenses for the maintenance of establishments for the preparation of viruses, serums, toxins, and analogous products, for use in the treatment of domestic animals, intended for sale, barter, exchange, or shipment as aforesaid. The Secretary of Agriculture is hereby authorized to issue permits for the importation into the United States of viruses, serums, toxins and analogous products, for use in the treatment of domestic animals, which are not worthless, contaminated, dangerous, or harmful. All licenses issued under authority of this act to establishments where such viruses, serums, toxins, or analogous products are prepared for sale, barter, exchange, or shipment as aforesaid, shall be issued on condition that the license shall permit the inspection of such establishments and of such products and their preparation: and the Secretary of Agriculture may suspend or revoke any permit or license issued under authority of this act, after opportunity for hearing has been granted the licensee or importer when the Secretary of Agriculture is satisfied that such license or permit is being used to facilitate or effect the preparation, sale, barter, exchange, or shipments as aforesaid, or the importation into the United States of any worthless, contaminated, dangerous, or harmful virus, serum, toxin, or analogous product for use in the treatment of domestic animals. That any officer, agent, or employee of the Department of Agriculture duly authorized by the Secretary of Agriculture for the purpose may, at any hour during the daytime or nighttime, enter and inspect any establishment licensed under this act where any virus, serum, toxin, or analogous product for use in the treatment of domestic animals is prepared for sale, barter, exchange, or shipment as aforesaid. That any person, firm, or corporation who shall violate any of the provisions of this act shall be

deemed guilty of a misdemeanor, and shall, upon conviction, be punished by a fine of not exceeding \$1,000 or by imprisonment not exceeding one year, or by both such fine and imprisonment, in the discretion of the court.

TESTING SAMPLES OF SERUM.—In addition to the above, samples of serum were tested whenever it was deemed advisable and unopened samples could be procured without knowledge on the part of the producing company.

We do not favor the testing of samples procured directly from the producing laboratory. In carrying on this work 57 samples were tested. Each test when properly conducted requires eight shoats of 40-90 pounds in weight which have had no known exposure to hog cholera. This testing work has been supplemented by such supervision of the results in the "field" (actual practice) from the use of commercial serum coming from the various plants. In several instances the company from which the serum was obtained adjusted matters with the farmers where the results were unsatisfactory. During the past year it has not been impossible to secure a sufficient quantity of dependable commercial serum at any time. Undoubtedly, the combined efforts of the Bureau of Animal Industry and this laboratory along these lines have been very beneficial.

VIRUS DISTRIBUTION.—It should be appreciated that our efforts during the past two years necessarily have been directed toward the saving of as much of Iowa's great annual loss from hog cholera as possible. As the disease becomes suppressed, however, the question concerning the distribution and use of virus becomes more acute. The distribution is provided for in Section 6.

This has for its object, as I understand, to prevent shipments of virus being made into localities where hog cholera does not exist, and where there would be danger associated with its use. This also presumes that when an application is filed, the director has knowledge concerning conditions in the community for which the shipment is intended. This, however, with our organization, is impossible. There is no time for investigation since, if the shipment is intended for a herd already infected the disastrous results would be suffered by the farmer, the person we are trying to protect. This responsibility should be placed upon the person who uses virus, but every shipment and its destination should be reported to the director of the State Biological Laboratory.

The provisions of the law in regard to the use of virus are set forth in Section 6.

VIRUS PERMITS.—In order to arrive at a conclusion as to what a reasonable requirement would be as pertains to the special instructions a conference was called by the president of the college to which were invited the state veterinarian, the president of the State Veterinary association, Dr. W. B. Niles, the president and

secretary of the Iowa Swine Breeders' association, the dean of agriculture of I. S. C., the head of the animal husbandry department, and the director of the State Biological Laboratory. The following conclusions were adopted:

The applicant must show to the satisfaction of the director of the laboratory that he has ability to diagnose hog cholera, including knowledge of antemortem symptoms and postmortem lesions.

Applicant must have had previous successful experience in the use of virus. If applicant and his experience are unknown to the director of the laboratory, satisfactory evidence must be furnished by reliable persons who have personal knowledge.

If applicant has not had satisfactory experience he will be required to receive instruction at the veterinary division at Ames under direction of the director of the laboratory and satisfy the director while on the ground that he is competent to use the virus.

On Wednesday of each week the director of this laboratory will be prepared to give special instruction at Ames upon the use of the virus and hog cholera serum.

The law does not clearly state whether or not the use of virus shall be limited to practicing veterinarians, but it does clearly indicate that much information which veterinarians have is essential to the use of virus; therefore, the director should use special care to satisfy himself in connection with application of any person other than a competent veterinarian, that this person is sufficiently trained along the lines of sanitation, immunization and bacteriology to have a fundamental knowledge to enable him to receive the brief instruction that is offered at the college for persons wishing to secure permits.

After the initial rush for permits was over the 1st Wednesday of the month was set aside as demonstration day for veterinarians, and 364 graduates and 65 non-graduates have been granted permits.

It should be stated that where the character and training of the veterinarian was unknown to the director the veterinarians are requested to visit the laboratory. While this was objected to by a few it nevertheless was for the best interests of the work.

While the general permits to use virus have been issued to licensed veterinarians only, there are many hog owners who desire to treat their own hogs, and many have done so with apparent success by using the simultaneous treatment (serum and virus). The hog owners almost without exception visited the laboratory before receiving permission to administer the virus. Some farmers and a few licensed veterinarians were refused such permits. In all 1295 permits have been granted to use virus in this state. There have been no authentic reports come to us where the careless use of virus has been responsible for serious outbreaks of cholera during the past eighteen months.

The following questions and answers relative to the use of hog cholera serum compiled at the Agricultural College, East Lansing, Michigan, are of interest in comparing the views of men in different states.

Name of State	Do you regard im- munes having been immunized by the simultaneous as chol- era carriers?	What percentage of animals in healthy herds do you estimate as a loss due to treat- ment?	Serum alone	Which method of us- ing serum has given most satisfactory re- sults in your state?	Which method are you advising at pres- ent?	Do you sel rum direct to farmers?	What do you charge for se- rum?
Arkansas	Yes	1	0	Simultaneous	Simultaneous	Yes	1%
California	Don't know	1	0	Simultaneous	Simultaneous	Yes	2%
Iowa	No	1 8-10	1½	Simultaneous	Both	Yes	1½
Indiana	No	1 to 2	0	Simultaneous	Simultaneous	No	1
Kentucky	No	1 to 2	less 1	Both	Both	Yes	1½
Kansas	?	2½	0	Both	Both	Yes	Free
Minnesota	?	2	0	Single	Single	No	Free
Maine	?	2	0	Both	Both	Yes	2
Mississippi	No	About 1	0	Both	Both	Yes	1½
Maryland	No	1	0	Simultaneous	Simultaneous	Yes	1
Michigan	No	3	0	Both	Both	Yes	1½
Nebraska .....	.....	.....	.....	.....	.....	Yes	3
New York .....	.....	.....	.....	.....	.....	Yes	1½
Nevada .....	.....	.....	.....	.....	.....	Yes	1½
Oklahoma	Yes	10	5	Single	Single	No	1½
Ohio	No	.....	0	Simultaneous	Simultaneous	No	2
Pennsylvania	Yes	Not used	0	Single	Single	Yes	1½
South Carolina	No	.....	0	Single	Single	Yes	1½
North Carolina	No	2	0	Simultaneous	Single	Yes	1½
Texas	No	2	0	Simultaneous	Single	Yes	1½
Virginia	Yes	.....	.....	Single	Single	Yes	1
Wisconsin	Yes	2 to 3	0	D	D	Yes	.....
Illinois	Yes	.....	.....	Simultaneous	Simultaneous	Yes	.....

EQUIPMENT ON HAND.—The provisions of section 10 were carried out as soon as practicable and the following equipment was turned over to the director:

1 Monarch visible writer machine	1 Mixing jar
1 Typewriter desk	6 Five-gallon bottles
1 Portable scales	2 Specimen jars
1 Autoclave	5 Dozen glass stopper pint bottles
2 Dozen one gallon bottles	2 Sacks corks
2 Dozen one-half gallon bottles	2 Zinc covered tables
1 Case 4 oz. bottles	1 Small gas engine
1 Case 8 oz. bottles	1 Plunge dipping tank
Two-third case 16 oz. bottles	

In addition to the above as much equipment as could be spared in the Veterinary Division was utilized and some has been purchased from the serum fund from time to time as needed.

FUNDS.—In addition to the buildings and equipment already mentioned, one building of a semi-permanent character was erected at a cost of approximately \$18,000.00. The cost of buildings and equipment was kept down as low as possible in order to leave a satisfactory working fund. This was found to be quite satisfactory until the output began to exceed the demand during the dull season (winter). It is evident that during such a season our funds would soon be invested in a stock on hand. This fact threatened to close the laboratory for a time during the winter but notices were sent out that advanced orders would be received when accompanied by cash and these led to the deposit of \$12,100.34 by hog owners and people interested in saving Iowa hogs. From the standpoint of the state this may be looked upon as a loan. It enabled us to keep the laboratory open during the winter and supply many persons with state serum during the past summer who were not able to advance money.

PRICE OF SERUM.—The "foreign" serum distributed by this laboratory was handled at approximate cost. The serum made here was sold at 2c per cubic centimeter until June 1, 1914. At this time our work had become sufficiently stable so as to enable us to arrive at a fair conclusion and after a careful examination of our records by Mr. J. W. Bowdish, auditor for the State Board of Education, the price of serum was reduced to 1½c per cc. This price has allowed a small margin of safety and could be reduced somewhat if a permanent plant is established with sufficient land to enable us to handle hogs to the best advantage.

If in addition to the above the supervision of the sale of commercial serum, the testing of samples of serum, the supervision of the distribution and use of virus, and the general work which at present is necessarily carried on in addition to the actual production of serum could be provided for from some other fund than serum sale receipts the cost of production per cc. could be reduced to approximately 1c-1¼c.

RECORDS AND REPORTS.—The following application blank for serum is filled out when each order is received, and after the order

has been filled the application is filed under the name and a number:

State Biological Laboratory, Charles H. Stange, Director, Division of Veterinary Medicine, Iowa State College. Amount.... Remarks....

Application for Serum

Ames, Iowa....191.... Owners name In care of....address....
(town).... (county) No. of hogs.... wt.... No. of hogs.... wt....
No. sick....No. healthy....distance to nearest outbreak....Amt. of
serum sent....series No....Amt. of virus sent....series No....
By whom order sent....By whom order received....How order re-
ceived....Date order was filled....191....

The following blank is sent out with the serum and returned after the herd has been treated:

State Biological Laboratory for the Manufacture and Distribution of Hog Cholera Serum Toxins, Vaccines and Biological Products

Charles H. Stange, Director, Division of Veterinary Medicine, Iowa State College, Ames, Iowa

Report on Herd Vaccinated

Date....191....Name of owner....Address....Method used....
Serum No....Virus No....Number of animals in herd....Number
with normal temperature....Number vaccinated....Work done by....
Remarks....No....Tem....Wt....Ser....Vir....

In four to six weeks after the order is filled the following blank is sent to the owners of the herds. Unfortunately, however, it is difficult to get more than about one-half of the hog owners to fill out the blanks and return them.

State Biological Laboratory for the Manufacture and Distribution of Hog Cholera Serum Toxins, Vaccines and Biological Products

Charles H. Stange, Director, Division of Veterinary Medicine, Iowa State College, Ames, Iowa

Report on Use of Hog Cholera Serum

Kindly fill in blanks below as it is important information and may determine to a large extent our ability to assist you in future outbreaks of hog cholera. We have filled in the information we have in this office. C. H. Stange, director.

Name of owner....Address....Date serum was sent...Number cc. sent
....Series number of serum....Date used....Was all serum sent used
....Number of hogs in herd....Number of hogs treated....Number of
vaccinated hogs died....Number sick when treated....Number died
before treatment....Number of untreated hogs died....By whom
treated....Was virus used with serum....Date of this report....
Remarks....

EXPERTS AND ASSISTANTS.—The members of the Veterinary faculty deserve credit for their loyal support and assistance in organizing the work and starting the serum production. The work was handled by the regular faculty during the summer vacation and up to September 1, 1913.

Great care was taken in selecting the expert to take charge of the serum production. The position was offered to Dr. C. G. Cole, who had at that time 3½ years' experience in serum production with Dr. W. B. Niles of the United States Bureau of Animal

Industry, who is one of the discoverers of the serum treatment. Since September 1, 1913, Dr. Cole has been in charge of the serum production and testing. Dr. D. W. McAhren, formerly pathologist for the state serum plant under the state veterinarian, was secured as assistant but he later accepted a very generous offer made by a commercial serum plant. Dr. J. D. Cecil of Philadelphia was secured to fill the vacancy but he also accepted a position with a commercial firm, after being with us for several months. Dr. N. E. Koenig of Cornell university took Dr. Cecil's place. Dr. F. W. Cairy was secured as an assistant soon after the laboratory was established and remains in the work.

The other men employed in serum production should be classed as skilled laborers. They are employed by the month at from \$60-\$75 per month. These skilled laborers are too often taken by other serum plants at about \$100 per month.

VOLUME OF BUSINESS.—The following monthly balance sheets adopted January 1, 1914, show the volume of business done as follows:

STATE BIOLOGICAL LABORATORY BALANCE SHEET

	May, 1913, to December, 1913	January, 1914	February, 1914	March, 1914	April, 1914	May, 1914	June, 1914	July, 1914	August, 1914	September, 1914	October, 1914	November, 1914	December, 1914	Total
HOG DEPT.—														
Hogs on hand.....	none	681	928	845	889	727	535	595	792	1,055	718	710	438	
Hogs bought.....	3,397	912	812	629	307	238	565	1,066	1,227	662	728	461	812	11,836
Total	3,397	1,593	1,740	1,474	1,196	985	1,100	1,661	2,019	1,717	1,446	1,171	1,250	
Hogs slaughtered.....	1,944	444	458	360	275	331	415	507	839	575	558	547	526	7,779
Hogs tanked.....	1,234	103	115	113	68	80	140	71	69	140	139	108	97	1,395
Hogs sold.....	538	118	322	112	126	39	*18	304	56	284	39	78	24	2,058
Total	2,716	665	895	585	469	450	505	869	964	999	736	733	647	11,233
Balance on hand.....	681	928	845	889	727	535	595	792	1,055	718	710	438	603	603
SERUM DEPT.—														
Serum on hand.....	none	1,021,991	1,610,431	2,198,161	2,394,826	2,588,439	2,569,954	1,557,229	976,594	602,003	701,128	749,153	1,127,193	
Serum produced.....	3,286,431	999,420	901,430	534,850	490,375	469,545	582,570	490,825	700,145	703,912	881,455	633,360	785,586	11,459,902
Serum returned.....	59,745	36,375	3,250	8,750	11,875	2,000	8,000	8,875	none	250	15,500	5,375	none	159,995
Total	3,346,176	2,057,786	2,515,111	2,741,761	2,897,976	3,059,984	3,160,524	2,056,929	1,676,739	1,306,163	1,598,083	1,387,888	1,913,879	11,619,897
Serum sold.....	2,264,440	443,730	316,475	346,310	307,987	488,105	1,598,570	1,042,361	1,049,361	560,185	817,465	250,295	140,849	9,626,157
Serum used in S. B. L.	13,000	2,000	400	none	650	1,050	2,000	1,700	1,000	1,100	1,800	800	1,450	26,950
Serum for revacation.	17,625	none	none	none	none	none	none	none	24,375	43,750	25,165	9,000	6,000	125,915
Serum destroyed.....	29,120	1,625	75	625	none	875	2,725	36,250	none	4,500	4,500	9,000	2,125	77,920
Total	2,324,185	447,355	316,950	346,935	308,637	490,030	1,603,299	1,080,335	1,074,736	605,035	848,930	260,095	150,424	9,856,942
Balance on hand.....	1,021,991	1,610,431	2,198,161	2,394,826	2,588,439	2,569,954	1,557,229	976,594	602,003	701,128	749,153	1,127,753	1,762,955	1,762,955
CARCASS DEPT.—														
Carcasses on hand.....	none	101	115	113	68	80	71	58	69	140	139	108	97	1,393
Hogs slaughtered.....	234	101	115	113	68	80	71	58	69	140	139	108	97	1,393
Total	234	101	115	113	68	80	71	58	69	140	139	108	97	1,393
Carcasses sold.....	234	101	115	113	68	80	71	58	69	140	139	108	97	1,393
Balance on hand.....	none	101	115	113	68	80	71	58	69	140	139	108	97	1,393
Total weight.....	46,811	18,640	24,051	22,853	15,203	14,011	16,960	13,074	13,302	22,708	23,891	22,664	17,812	271,960
Total revenue.....	\$3,276,777	\$1,304,820	\$1,683,571	\$1,959,711	\$1,064,724	\$980,777	\$1,187,207	\$915,187	\$931,147	\$1,589,566	\$1,672,377	\$1,586,487	\$1,246,847	\$19,038,607
Rev. from tankage.....	13.09	13.28	10.75	9.95	11.75	2.00	11.00	34.00	9.00	.....	6.60	26.50	.....	325.82
Revenue from hides.....	19.93	.....	27.00	.....	24.85	.....	.....	.....	.....	.....	.....	.....	.....	147.88
Revenue from grease.....	719.64	.....	.....	.....	879.21	150.86	343.20	326.03	.....	.....	.....	.....	.....	4,897.01

* Escaped, 1.

It will be noticed that during some months between one and two thousand head of hogs were handled. On the whole the capacity of the plant has been crowded as much at all times as circumstances would permit.

The amount of serum produced by months is as follows:

To January 1, 1914.....	3,286,431 cc.
January, 1914	999,420 cc.
February, 1914	901,430 cc.
March, 1914	534,850 cc.
April, 1914	490,075 cc.
May, 1914	469,545 cc.
June, 1914	582,570 cc.
July, 1914	490,825 cc.
August, 1914	700,145 cc.
September, 1914	703,910 cc.
October, 1914	881,455 cc.
November, 1914	633,360 cc.
December, 1914	785,586 cc.

Total amount to Jan. 1, 1915....11,459,902 cc

A simple estimation will show that this is sufficient to immunize \$3,000,000 worth of hogs by direct vaccination not considering the protection it rendered the surrounding herds. If we should add to this the benefits derived from the supervision of the distribution and use of virus, also the licensing of commercial plants and testing their products, we would have a much larger sum. The value of extension work in this connection is referred to later.

The following letter was received from the Bureau of Animal Industry regarding foot and mouth disease quarantine and the State Biological Laboratory co-operated in every particular:

United States Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C.

MD-H

E-25152

November 14, 1914

Dr. C. H. Stange, Agricultural College, Ames, Iowa:

Dear Sir—I inclose herewith a letter of instructions being issued to inspectors in charge of establishments which hold a license from the Secretary of Agriculture under the provisions of the act governing the preparation, shipment, etc., of viruses, serums, toxins and analogous products intended for use in the treatment of domestic animals. It appears to me that these precautions are most desirable at this time. I wish to suggest that similar precautions applied to state serum plants and to commercial establishments doing business entirely within a state and over which the federal government has no control, would be most desirable.

Very truly yours,

A. D. MELVIN, Chief of Bureau.

United States Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C.

(Circular Letter 548)

MD-WS

E-251.52

November 13, 1914

INSTRUCTIONS RELATIVE TO FOOT-AND-MOUTH DISEASE FOR
INSPECTORS IN CHARGE OF VIRUS SERUM CONTROL WORK

1. The regulations of the United States Department of Agriculture to prevent the spread of foot-and-mouth disease in cattle, sheep, other ruminants, and swine absolutely prohibit the movement of these classes of live stock from each of the following states: Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Wisconsin.

2. In order to prevent the dissemination of foot-and-mouth disease through biological products, intended for use in the treatment of domestic animals, the following precautions should be taken at all establishments holding a license from the Secretary of Agriculture under the provisions of the act governing the preparation, shipment, etc., of viruses, serums, toxins, and analogous products intended for use in the treatment of domestic animals.

3. Establishments located in states quarantined on account of foot-and-mouth disease. (See paragraph 1).—No new stock of any kind should be brought on the premises of the establishment after the receipt of these instructions until further orders. The live stock on hand should be carefully inspected for foot-and-mouth disease, and all pens, chutes, runways, yards and buildings in which animals are housed or handled should be disinfected as provided for below. If in any case symptoms indicating the presence of foot-and-mouth disease are observed all operations should be suspended, the plant quarantined, and the chief of the bureau of animal industry in Washington notified at once by wire.

No serum or virus prepared or bottled subsequent to October 1, 1914, should be shipped out from the plant until these instructions are modified by further orders.

4. Establishments located in states not quarantined for foot-and-mouth disease.—New stock should be admitted to the premises of the establishment only when originating on farms outside of the quarantined areas (see paragraph 1), and on farms certified to be free of foot-and-mouth disease by a reputable veterinarian. All incoming stock should be carefully inspected in pens set aside for that purpose at the establishment and should be used for the production of serums, viruses, etc., only after being found to be free from any indication of foot-and-mouth disease by the inspector at the plant. As a precautionary measure all pens, chutes, runways, yards, buildings, etc., used for live stock of any kind should be thoroughly disinfected and a careful quarantine of the premises of the establishment should be maintained by the owners. All serum test pigs, and pigs used for the production of virus, should be carefully examined by the inspector for indications of foot-and-mouth disease. No virus for simultaneous inoculation should be shipped out from the plant unless it contains 1 per cent of carbolic acid by volume, that is 4 parts to 1 part of 5 per cent carbolic acid solution, and such carbolized virus should be held in the establishment forty-eight hours before shipment. All serum must contain $\frac{1}{2}$ per cent carbolic acid.

5. Disinfectants permitted to be used under the regulations to prevent the spread of foot-and-mouth disease:

1. Mercuric Chlorid. Use solution 1 to 500 for feet of horses, and solution 1 to 1,000 for harness, saddles, wagons, blankets, etc. Also permitted for hides.
2. Forty per cent formaldehyde solution. Use 1 quart to 5 gallons of water for surfaces of buildings, yards, pens, alleys, cars, leather goods, garments, blankets, etc.
3. Formaldehyde gas, for hay, straw, sheep skins, with wool on, wool hair, garments, etc. May also be used for interior of tight buildings. Use 20 ounces 40 per cent formaldehyde solution to 16-23 ounces potassium permanganate for each 1,000 cubic feet of air space to be disinfected.
4. Compound solution cresol (U. S. P.). Use 3 per cent solution in water, for cars, pens, buildings, yards, hides, garments.
5. Substitutes for compound solution cresol. These must contain not less than 50 per cent actual cresylic acid, and sufficient soap to render the cresol completely soluble. Use in 3 per cent strength and for purposes named under compound cresol solution. The following substitutes are now permitted: Special cresol compound prepared by the Barrett Manufacturing Co., Frankford, Philadelphia, Pa. Cooper's Fluid Dip (prepared by Wm. Cooper & Nephews, Chicago, Ill.).
6. Chlorid of lime (U. S. P. strength, 30 per cent available chlorine). Use 1 pound to 3 gallons of water. Mix 1 pounds thoroughly and uniformly with about a quart of water, then dilute it to a total of 3 gallons. For surfaces of buildings, yards, pens, alleys, cars, etc.
7. Crystal carbolic acid. Use 5 per cent solution, for same purposes as formaldehyde solution and chloride of lime, also hides.

3. Symptoms of foot-and-mouth disease in hogs.—The first symptoms of foot-and-mouth disease in hogs is, rise in temperature, running from 105 degrees to 100 degrees. This occurs during the incubative stage and is of short duration in hogs. The vesicles which are characteristic of the disease appear usually first on the feet between the toes and at the junction of the hair and the hoof. Vesicles may be found on the tip of the snout, also in the mouth, and on the head. The vesicles persist for only a short time; they soon burst and leave behind a moist eroded area, the erosions healing quickly by proliferation of the epidermis. Previous to healing, these erosions are recognizable by sharply marked limits between the sound tissue and the eroded area. The erosions on the foot of hogs are characterized by a tendency to hemorrhages; sloughing off of the hoofs as a result of the disease is not unusual. The objective symptoms in hogs consist chiefly in lameness and in general sluggishness.

A. D. MELVIN, Chief of Bureau.

RESULTS OF VACCINATION.—The total number of herds treated as recorded in our books to January 1, 1915, is 5,000. A considerable number of these have reported on the use of serum.

A summary of the reports received up to October 1st is as follows:

	No. treated	No. sick when treated	No. died before	No. died after	Per cent sick	Per cent died
Serum alone	14,395	5,840	2,225	4,388	41	30
Serum alone	5,060	.....	.....	117	0	2
Serum simultaneous	44,646	6,296	3,308	5,094	14	11.4
Serum simultaneous	90,338	.....	.....	1,724	0	1.9
Total	154,439					

The 90,338 hogs reported as treated simultaneously included 1,407 herds. In 77% of these herds there was reported no loss. In 23% of the herds there was some loss from various causes. A number of losses in herds were investigated and it was found that in most cases the treatment was applied to hogs that were not in condition to receive such treatment. If the results are to be satisfactory the hog must be in good physical condition as every devitalizing influence favors the infection and impedes the action of the serum. The most common conditions found which were unfavorable to the results from the simultaneous treatment were parasitism especially severe infestation with lung or intestinal worms or both, poor food and sanitary conditions, applying this treatment to pregnant or nursing sows and many times also to the young pigs, exposure of hogs to deleterious influences after the treatment was applied and other concurrent diseases.

The following table summarizes the results as pertain to the herds reported upon in which the simultaneous treatment was used. These herds were reported as healthy at the time of treatment:

1,085 herds, 59,738 head—no loss.

118 herds, 8,244 head—1 died.

53 herds, 5,625 head—2 died.

151 herds, 16,731 head—3 or more died.

1,407 herds, 90,338 hogs; 77% of herds, no loss; 23% of herds, some loss.

The results on the whole appear to be very satisfactory in view of the fact that we have but little control of the immediate application of our serum.

Much has been said regarding the effect of vaccination on breeding swine and in order to secure definite figures information was gathered in co-operation with the Bureau of Animal Industry. The results are summarized in the following table:

Treated Herds

	Herds	Sows treated	Pigs farrowed	Sterile sows	Per cent sterility	Av. No. pigs
Sows and boars treated.....	101	1431	8860	79	5.5	6.18
Sows treated and boars not treated.....	20	287	1934	19	6.6	6.74
Sows treated and boars ?.....	5	28	177	0	0	6.32
	126	1746	10971	98	5.6	6.28

Herds Not Treated

	Herds	Sows treated	Pigs farrowed	Sterile sows	Per cent sterility	Av. No. pigs
Sows not treated and boars treated.....	11	164	986	12	7.3	6.01
Sows and boars not treated.....	67	835	4048	62	7.4	4.85
Sows not treated, boars ?.....	9	104	338	0	0	6.25
	87	1103	5372	74	6.7	4.87

Attention is called to the fact that the percentage of sterile sows is greater in non-treated herds and that the average number of pigs per sow is lower. Theoretically, therefore, one could say that vaccination is beneficial but for the present let us at least assume that it is not injurious.

RESOLUTIONS.—The United States Live Stock Sanitary Association has given support to the movement for supervision of the serum plants by issuing the following:

The executive committee of the United States Live Stock Sanitary association in special session, Chicago, May 6, 1914, drafted following recommendations, addressed to the governor of each state, recommending immediate action by state authorities for state control of hog cholera serum laboratories operating within the various states without a federal license.

Whereas, Hog cholera gives promise of being extremely prevalent during the coming season, and

Whereas, Reliable hog cholera serum as produced under the Dorset-McBride-Niles system is of great value in controlling and suppressing the disease;

Whereas, It has come to the knowledge of this committee that many hog cholera serum plants are in operation in various states which plants are not licensed by the U. S. Department of Agriculture nor under federal or state supervision;

Whereas, We believe there is much serum being placed upon the market, which may be absolutely unreliable and a detriment to hogs upon which it is used;

Whereas, Attention has been further directed to the placing on the market of fictitious serum, which in some cases is known not to have contained any animal serum;

The above recommendations may well serve as ideals and should be approached as nearly as possible. As applying to conditions found in Iowa especially, the following are most applicable:

RESOLUTIONS UNANIMOUSLY ADOPTED AT A CONFERENCE
OF FEDERAL AND STATE OFFICIALS IN CHARGE OF HOG
CHOLERA SUPPRESSION—AUDITORIUM HOTEL, CHICAGO,
ILLINOIS, MARCH 3, 1914.

Dr. A. D. Melvin, Chief U. S. Bureau of Animal Industry, Chairman of the Meeting.

We regard hog cholera as one of the greatest questions before the public at this time. The disease has been prevalent many years, with losses fluctuating between wide limits. The heaviest losses, as shown by the best available data, were 120 and 130 hogs per thousand in 1887 and 1897, respectively. The estimates for 1913 are 100 less per thousand, and the indications are that the disease is passing through another period of rapid increase. In view of the high cost of living, such enormous losses of a valued food product must be regarded as a calamity.

The main problem at this time is to control the disease. With progress now being made, both in science and practice, it may be expected that the question of eradication will come up later; but, unquestionably, the matter of control will be uppermost for years to come.

For success, the first requirement is an honest and earnest purpose to co-operate as between all the interests involved, especially the scientists, the veterinary profession, farmers, common carriers, and packing interests.

The control and final eradication of hog cholera will depend largely upon the education of farmers to the importance of observing sanitary principles.

The serum alone treatment may be given by anyone without danger of causing hog cholera. Such harm as follows this treatment is due mostly to ignorance in the use of serum or of sanitation. While it is preferable to have serum used only by competent veterinarians, it is not deemed advisable to require that laymen may not use serum alone.

The closest possible supervision of the manufacture and distribution of serum should be provided, to assure its purity and potency. It is believed that this should be in charge of federal authorities in such plants as may properly come under their supervision, and provision should be made in the different states to duplicate and supplement the federal efforts along this line.

It is desirable for the states to manufacture serum, but neither by the size of the plant nor by the price of the product, should this effort be monopolized by the states.

The simultaneous treatment should be used only by those who have had special training. The ideal arrangement would be to allow its use only by federal and state veterinary officers. Other officers who have sufficient training in the use of virus, and in sanitation, may use the simultaneous treatment with safety. Where it is not possible to restrict virus to official hands because of shortage of funds

or lack of officers, or for other uncontrollable reasons, it should then be used only by such other persons as have been given a special permit after receiving special instructions, which is as thorough and detailed as feasible, and who show that they understand the essential fundamental principles. But in any such case, the unofficial laymen should be permitted to use virus only in his own herd, and then only if the district is already infected.

The manufacture, distribution and use of virus should be rigidly supervised by federal and state authorities.

Quarantine and sanitary measures should be much more actively emphasized and enforced. Especially, it is important that freight cars which have carried infected stock shall be promptly disinfected after unloading, and infected premises should be rigidly quarantined.

The prevailing practice of rushing sick herds to market should be discouraged in every way possible, and in lieu of such disposal of sick herds, the owners and other persons concerned should be advised and encouraged to treat them with anti-hog cholera serum.

The promulgation and enforcement of all live stock sanitary regulations and other measures incident to quarantine should remain invested in the livestock sanitary boards and state veterinarians of the various states.

Progress in combating hog cholera is being made. Special credit is due to individual efforts on the part of veterinarians and farmers. The intelligent interest of county agricultural agents is commended, and it is believed that these agents should give chief attention to assisting farmers to secure the aid of competent veterinarians, and when that is not possible, they should assist the farmers themselves to take proper remedial measures, always emphasizing the importance of sanitation. There is recommended the temporary assignment of a competent veterinarian by the state government, independently or in co-operation with the federal government, to any district where difficulties on account of hog cholera are most acute, his services to be available to farmers without cost, for the purpose of demonstrating the best methods in different communities.

Work of the highest character is being done by the United States Bureau of Animal Industry, which Bureau brought out the serum treatment for hog cholera, a treatment which has been adopted in most states and countries where the disease exists. We acknowledge with appreciation the action of Congress, whereby far more liberal provision than ever before has been made to investigate and combat the ravages of hog cholera. Similar provision has been made in several states but the legislatures are urged to make more liberal appropriations of this character.

There should be the closest co-operation between states and federal authorities, and all persons concerned should be willing to suppress

their own opinions on relatively unimportant matters, and follow the lead of federal authorities in the interest of the adoption of uniform methods throughout the entire country.

(Signed)

G. R. WHITE, Tennessee.
W. M. JARDINE, Kansas.
W. B. NILES, U. S. Dept. of Agri.
WARD GILTNER, Michigan.
R. A. PEARSON, Iowa, Chairman.

In many states an agreement is entered into by the owner of the hogs before serum is furnished or a herd is treated. The following used in the state of Ohio may serve as an example:

AGREEMENT

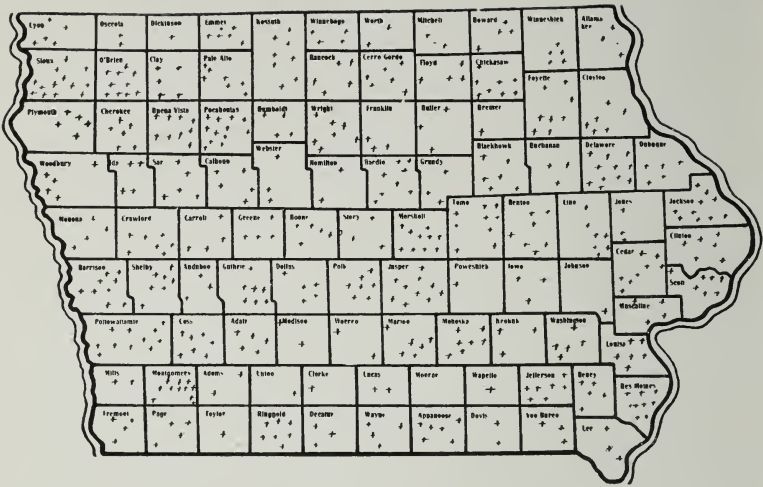
I have read Bulletin No. 6 on Hog Cholera Protective Inoculation, issued by the Board of Live Stock Commissioners in April, 1909, and desire to have my herd of swine treated with protective serum prepared under the direction of said board. I understand that the Board of Live Stock Commissioners guarantees no specific results from the administration of this serum, and assumes no responsibility beyond the careful administration of serum, the potency of which has been tested in its laboratories.

I further agree to pay, immediately upon completion of the work, at the rate of 25 cents per 20 c.c. of serum furnished for the inoculations, or at the rate of 12½ cents for pigs weighing under 20 lbs., 25 cents for pigs weighing from 20 to 50 lbs., and at the rate of 50 cents per 100 lbs. for heavier pigs.

No such agreement has been required at this laboratory chiefly because of the delay it would occasion in getting the herd treated.

EDUCATIONAL WORK.—The educational work which has been of great value in the hog cholera work in this state was carried on by four veterinarians in the Agricultural Extension Department, one of whom (Dr. Willey) has been with us but a few months. This work has consisted largely of lectures and demonstrations. The farmers have been informed concerning the significance of hog cholera, how it may be recognized, prevented, controlled and how the serum should be and should not be applied.

The following map shows how well the state was covered up to July 1, 1914, in giving hog cholera lectures and demonstrations:



The Bureau of Animal Industry is doing co-operative work in Clay and Dallas counties.

SUMMARY

Total number hogs handled to January 1, 1915.....	11,836
Total amount serum produced to Jan. 1, 1915....	11,459,902cc.
Total amount serum distributed to Jan. 1, 1915....	9,856,942cc.
Total number counties to which serum was sent.....	95
Total amount money received to Jan. 1, 1915.....	\$233,048.40
Total number orders shipped to Jan. 1, 1915.....	4,984
Total number graduate veterinarians holding permits to use virus	418
Total number non-graduate veterinarians holding permits to use virus	63
Total number lectures and demonstrations given by extension veterinarians	535
Total number people present at lectures and demonstrations	20,379
Total number counties covered by extension lectures.....	99
Total number serum permits granted 1913.....	25
Total number serum permits granted 1914.....	64

Respectfully submitted,

C. H. STANGE, *Director.*



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